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Photo-Enlargements as Teaching Aids

H. L. Dean
State University of Iowa

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H. L. Dean

In teaching Botany at the State University of Iowa the usual visual aids are regularly employed. These include lantern slides, motion pictures, charts, models and demonstration exhibits. The present note describes another useful visual aid in the teaching of Botany — the use of photo-enlargements. Teachers of other subjects should also find photo-enlargements of value in their classes.

Photo-enlargements were used by Professor R. B. Wylie about twelve years ago to illustrate features of the brown algae studied by him in Alaska. These photographs were so well received by his classes and created so much interest that additional enlargements of other botanical subjects were made. Under the direction of Professor Wylie this nucleus of a few dozen photographs has been expanded into an assortment of several hundred carefully selected enlargements. Subject matter ranges from algae and fungi to typical examples of the higher plants and their parts. Included in the collection are scenes showing ecological situations, flower types, ferns and tree ferns, marine algae, tropical plants, lumber trees and photomicrographs of plant structures commonly studied. Enlargements of especially good line drawings, maps and charts are a useful part of the collection.

Enlargements 11 x 14 inches in size, printed on double weight semi-matte paper, have been found best for teaching purposes. Smaller prints, for example 8 x 10 inches in size, are not easily seen by students in the back half of a small lecture room, and larger photographs tend to curl or buckle if not mounted or framed. Large prints 2 x $3\frac{1}{2}$ feet in size, or larger, are excellent for special purposes but must be framed for use. Prints of this size require very good negatives and are difficult to process without special equipment. Single weight paper is not recommended for unmounted enlargements. Glossy paper is usually unsatisfactory because of the objectionable glare reflected from the shiny surface. Of course, enlargements smaller than 11 x 14 inches are useful for close-up observation in laboratory or conference. In practice, 11 x 14 inch prints have been successfully used in a lecture room measuring about thirty feet from the lecturer to the back row of students, and in classes numbering up to fifty persons. Only those

prints having large structures with good, contrasting tones are suitable for the longer viewing distances. Prints with fine detail or emphasizing texture are to be used only at shorter distances, up to six feet. Photographs having sharp, clear cut details are to be preferred but enlargements in soft focus may often be used because the viewing distance is great enough to minimize irregularities of focus. Experiments quickly determine the maximum viewing distance for any photo-enlargement and it is a good practice to record this on the back of each print tested. A good rule is to enlarge the object of greatest importance as much as possible without losing the proper background or distorting perspective. Always exhibit the finished enlargements as close to the students as possible when using for lecture illustrations. Prints emphasizing detail or texture should be shown in display cabinets or left loose on desk tops for closer inspection by the students.

Negatives used in making enlargements have been derived from various sources. Staff members have contributed the greater percentage, but many have been loaned by students enrolled in elementary botany classes and from private individuals. The majority of negatives used have been 4 x 5 or $3\frac{1}{4}$ x $4\frac{1}{4}$ inches in size, a fair percentage $2\frac{1}{4}$ x $3\frac{1}{4}$ and scarcely any 35 mm. Satisfactory enlargements can be made from 35 mm. negatives, if carefully processed, but with ordinary materials the larger sizes are to be preferred.

Certain advantages of 11 x 14 inch photo-enlargements as visual aids may be listed. Neither projector nor screen is needed. They may be used repeatedly and are always available for study. Photo-enlargements may be used in summer classes with the windows open, not always possible with a lantern slide projector. The heat of the lantern is also dispensed with. Photographs may be made of valuable or delicate herbarium specimens. Prints, natural size or larger, may be handled and used for many of the usual observations upon such material without danger of injuring the original specimen. Such photographs may be handled considerably without serious damage. The judicious use of photo-enlargements helps create and maintain interest in lecture, laboratory and conference groups. A given amount of work is better covered in a shorter time when photographs are used to illustrate important points.

Limitations of photo-enlargements are chiefly that they are effective with small groups only, the cost per unit is greater than lantern slides and larger filing facilities are demanded. Breakage of the photographic emulsion on the paper sometimes occurs but

has not been serious in our experience. Prints inevitably become dirty but may be washed in water and re-dried, or dry-cleaned with art gum.

Strikingly effective illustrations may be obtained by the better processes of printing in natural color. Prints of this type are highly desirable for all purposes except line drawings, etc. The relatively high cost per print in the larger sizes and the exacting, time consuming work necessary to make these prints in the ordinary school dark room constitute major objections to the use of natural color prints for ordinary teaching purposes.

DEPARTMENT OF BOTANY,
STATE UNIVERSITY OF IOWA,
IOWA CITY, IOWA.